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(54) WINDOW SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a window system capable of managing a plurality of graphic planes easily.

SOLUTION: The window system has a plurality of planes (30a to 30c) for plotting a plurality of windows (21a to 21m) to be generated by an application program (5) and frame memories (12a to 12c) corresponding to the respective planes (30a to 30c) and storing data from the respective planes, and blends or selects output data from the respective frame memories (12a to 12c) on a display (16). The window system has an effective plane designating means (22) for selecting the plane (30a to 30c) for plotting from the plurality of the planes (30a to 30c) for each of the plurality of windows (21a to 21m).

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CLAIMS

[Claim(s)]

[Claim 1] The window system characterized by to have an effective plane assignment means is the window system which corresponds to two or more planes which draw two or more windows generated by the application program, and each of said plane, has the frame memory which memorizes the data from said each plane, blends or chooses the output data from each of said frame memory, and is displayed on a display, and choose said plane which is generated, and which performs drawing from two or more of said planes for two or more windows of every.

[Claim 2] The window system characterized by having the region management tool which divides the non-display field which is not displayed on the viewing area as which said window is displayed on said display in a window system according to claim 1 by making the plane to which drawing is performed among said two or more windows generated into an effective plane, and said display into a rectangle field, and manages the location and size of each rectangle field for every effective plane of two or more of said windows.

[Claim 3] The window system to which a redraw is characterized by notifying a required plane, the location of the rectangle field to redraw, and size to said application program in a window system according to claim 2 when change arises in the location or size of each rectangle field of said window.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention has two or more planes for drawing a viewing window, and relates to the window system which blends or chooses the indicative data of each plane, and is displayed on a display.

[0002]

[Description of the Prior Art] A window system is mentioned as an approach of outputting two or more application screens to a GURAFIKU plane. This window system is software which offers a virtual screen called a window and offers the function which can lay that virtual screen on top of the GURAFIKU plane of one sheet, and can be displayed on coincidence to an application program. If a user clicks the frame and the interior of a window by a mouse pointer etc., it will serve as an active window and the input in a keyboard or a mouse will be attained to the application.

[0003] An application program does not need to be conscious of screen drawing processing of other applications etc., if drawing processing is performed to the offered window.

[0004] Although many goods have come out of such a window system to the commercial scene, when an example is given, there is XWindow which operates on UNIX (trademark).

[0005] In these window systems, it has the window generating function (for example, in XWindow, it is function XcreateWindow()) which makes an argument ID of a parent window, and the attribute of a display position etc., and delivers them for communication with an application program. A window system secures the memory for storing the attribute information on the window which reacts to the window generating function which application performs, and is generated, and operates returning the identifier of the window concerned to application etc.

[0006] The information on the display condition of a window is also included in the above-mentioned window attribute information, and the information on the field actually displayed on the screen among the viewing areas of a window and the field which is non-display since other windows have lapped is stored in it. Such window attribute information is used in case a redraw event is notified that a window is redrawn to an application program in case overlap, size, etc. of a window are changed.

[0007]

[Problem(s) to be Solved by the Invention] By the way, it has two or more GURAFIKU planes, and the display corresponding to the multi-screen which blends or (combination) chooses and displays the contents of the GURAFIKU plane of these plurality is developed in recent years. Especially, in the field of the television receiver, digital broadcasting is started and, in response, a role of a display in a domestic digital network is expected from the television receiver equipped with the function of such a multi-screen from now on.

[0008] In the display equipped with the function of such a multi-screen, to display on coincidence various digital contents supplied from DTV (DigitalTelevision), DVD (Digital Video Disc), PC (Personal Computer), etc., such as a still picture, computer graphics, and text data, on many screens is desired not to mention the image.

[0009] However, in the conventional window system, it is not taken into consideration about two or more GURAFIKU planes.

[0010] Also in the display which followed, for example, was equipped with two kinds of GURAFIKU planes, Plane A and Plane B, only one of GURAFIKU planes are manageable by the conventional window system.

[0011] If two window systems are started, the application of what can manage the GURAFIKU plane of both Plane A and the plane B must program the processing to two window systems started, respectively, and will become the cause which causes increase of development cost.

[0012] This invention is made in view of such a situation, and it aims at offering the window system which can manage two or more GURAFIKU planes easily.

[0013]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the window system concerning this invention Two or more planes which draw two or more windows generated by the application program, Correspond to said each plane and it has the frame memory which memorizes the data from said each plane. It is the window system which blends or chooses the output data from said each frame memory, and is displayed on a display, and is characterized by having an effective plane assignment means to choose said plane which is generated and which performs drawing from said two or more planes for two or more windows of every.

[0014] Moreover, the non-display field which is not displayed on the viewing area as which said window is displayed on said display by making the plane to which drawing is performed among said two or more windows generated into an effective plane, and said display is divided into a rectangle field, and it is characterized by having the region management tool which manages the location and size of each rectangle field for every effective plane of two or more of said windows.

[0015] Moreover, when change arises in the location or size of each rectangle field of said window, a redraw is characterized by notifying a required plane, the location of the rectangle field to redraw, and size to said application program.

[0016] According to the description of this invention, since an application program can specify an effective plane alternatively, the both sides by the side of application and a window system should manage only the specified effective plane.

[0017] Moreover, since the effective plane of the window which change produced is notified from a window system also in case other windows on display move, or it is closed and the field which was non-display until now changes to a viewing area, an application program should perform redraw processing only to the plane notified.

[0018]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail, referring to a drawing.

[0019] Drawing 1 is drawing having shown typically the example of a configuration of the hardware for operating the window system in this operation gestalt, and drawing 2 is drawing having shown the example of a configuration of software typically. In addition, in the illustrated example, the window system 20 equipped with the

GURAFIKU planes 30a–30c of three sheets is shown, and every GURAFIKU plane 30a – 30c is equipped with the memory controllers 13a, 13b, and 13c and frame memories 12a, 12b, and 12c, respectively.

[0020] The window system 20 performed by CPU10 writes the data of each GURAFIKU planes 30a–30c in frame memories 12a, 12b, and 12c by the memory controllers 13a, 13b, and 13c through a bus 11.

[0021] The data of GURAFIKU plane 30a are read one by one from frame memory 12a by memory controller 13a, and are transmitted to the plane composition controller 14. Similarly, by the memory controllers 13b and 13c, the data of the GURAFIKU planes 30b and 30c are read from frame memories 12b and 12c one by one, and are transmitted to the plane composition controller 14.

[0022] The data read from each frame memories 12a, 12b, and 12c are blended or (combination) chosen, and the plane composition controller 14 transmits them to D/A converter 15. D/A converter 15 changes into an analog signal the data transmitted from the plane composition controller 14, and sends them to a monitor 16.

[0023] In drawing 2 , an application program 5 performs a window generating function, and requires generation of Windows 21a–21m from a window system 20. In case an application program 5 requires generation of Windows 21a–21m, it specifies alternatively the plane which draws this window out of the GURAFIKU planes 30a–30c with the effective plane assignment flags 22a–22m as an effective plane. Moreover, an application program 5 also performs the demand of drawing, a map, etc. to a window system 20 about the windows [finishing / generation] 21a–21m.

[0024] The window system 20 which received the demand of generation of a window, drawing, a map, etc. from the application program 5 divides the viewing area and non-display field of this window into the rectangle field called a region (REGION) for every effective plane of this window, and creates the region managed tables 23a–23n which manage the location and size of each region for every effective plane of this window. And based on region managed tables [23a–23n] information, the indicative data of each GURAFIKU planes 30a–30c is written in frame memories 12a, 12b, and 12c.

[0025] Drawing 3 (a) shows the example of assignment of window generating function CreateWindow() in the window system 20 of this operation gestalt. Window generating function CreateWindow() is a function required as having parent-window ID (parent) and an effective plane assignment flag (plane) as an argument, and generating a window newly by making into parents the window specified from the application program 5 by parent-window ID (parent) to the window system 20. This window generating function CreateWindow() returns as an output ID of the window generated newly to an application program 5.

[0026] The effective plane assignment flag (plane) consists of bit strings of N bit so that it may illustrate to drawing 3 (b). a bit 0 -- the 0 bit plane 1 -- the 1 bit plane 2 -- a plane 2 and Bit N supports Plane N, and when each bit value is "0", it is shown that it is "effective" in the case of an "invalid" and "1." An application

program 5 sets an "effective" flag about the plane which draws the window generated among the GURAFIKU planes which have more than one in a window generate time. [0027] Drawing 4 shows the example of a configuration of the region managed table 23 which is a memory table for managing the field which is not displayed as the field where the window is displayed. This region managed table 23 consists of a display region table 24 which manages the viewing area of a window, and a non-display region table 25 which manages the non-display field of a window, and is created for every effective plane of the window generated.

[0028] The display region table 24 divides the viewing area of a window into the rectangle field called a display region, and remembers a starting point coordinate (X, Y) and size (breadth, height) to be the divided numbers of display regions for every display region which divided. Similarly, the non-display region table 25 divides the non-display field of a window into a non-display region, and remembers a starting point coordinate (X, Y) and size (breadth, height) to be the divided numbers of non-display regions for every divided non-display region.

[0029] Drawing 5 shows the example as which two windows 40 and 50 are displayed on the GURAFIKU plane 30, and the window 50 has lapped with a part of window 40. The viewing area of this window 40 can be divided into two display regions 41 and 42 so that it may illustrate to drawing 6 , and the non-display field of a window 40 can be made into one non-display region 43, and is memorized as a region managed table 23 shown in drawing 8 so that it may illustrate to drawing 7 .

[0030] Thus, a window system 20 is always managing the viewing area and non-display field of a window on the region managed table 23, and in case it draws a window, it should perform drawing processing only to the viewing area of an effective plane. In addition, each value of this region managed table 23 is updated whenever the location of a window, size, and lap condition with other windows change.

[0031] Drawing 9 is the display equipped with the GURAFIKU planes 30 and 31 of two sheets, and has illustrated signs that the window 40 which made the GURAFIKU planes 30 and 31 the effective plane, the window 50 which made only the GURAFIKU plane 30 the effective plane, and the window 60 which made the GURAFIKU plane 31 the effective plane are displayed. Moreover, the example of a display of each above-mentioned window [in / in drawing 10 / the GURAFIKU plane 30] and drawing 11 show the example of a display of each above-mentioned window in the GURAFIKU plane 31.

[0032] Here, the example of a window system 20 of operation when AMMAPPU [a window 50] is explained. Since the effective plane of the window [AMMAPPU / window] 50 is the GURAFIKU plane 30 shown in drawing 10 , as shown in drawing 12 , the lap part (non-display field 45) of the window 40 which similarly makes the GURAFIKU plane 30 effectively plain changes to a viewing area.

[0033] Drawing 14 is drawing which illustrates an operating sequence when AMMAPPU [a window 50].

[0034] First, if the actuation "is closed" to a window 50 is made, an AMMAPPU demand will be notified from a window 50 to a window system 20 (Step01).

[0035] The window system 20 which received the AMMAPPU demand notifies the purport that performed processing concerning predetermined AMMAPPU and AMMAPPU was performed to the window 50 (Step02).

[0036] Next, a window system 20 notifies a redraw event to a window 40 (Step03).

[0037] The redraw event information 26 as shown in drawing 13 is added to a redraw event in that case. The GURAFIKU plane which takes a redraw to this redraw event information 26, the starting point coordinate (X, Y) of the region information which requires a redraw, and size (breadth, height) are contained.

[0038] The window 40 which received the redraw event notifies the completion of a redraw to a window system 20, after redrawing based on the data of the redraw event information 26 about the rectangle part applicable to the starting point coordinate (X, Y) as which the GURAFIKU plane 30 was specified, and size (breadth, height) (Step04).

[0039] In addition, although the GURAFIKU plane 31 of a window 40 is also effective, since the window [AMMAPPU / window] 50 does not have the effective GURAFIKU plane 31, the redraw event about the GURAFIKU plane 31 of a window 40 is not notified.

[0040] Moreover, since the effective plane of a window 60 is not the GURAFIKU plane 30, even if AMMAPPU [a window 50], it is not influenced of what.

[0041] Thus, since an application program 5 can specify an effective plane alternatively, the both sides by the side of application 5 and a window system 20 should manage only the specified effective plane.

[0042] Moreover, since the effective plane of the window which change produced is notified from a window system 20 also in case other windows on display move, or it is closed and the field which was non-display until now changes to a viewing area, an application program 5 should perform redraw processing etc. only to the plane notified.

[0043] As mentioned above, although the operation gestalt of this invention was explained to the detail, this invention is not limited to this example, but can accomplish various amelioration and modification in the range which does not deviate from the main point of this invention.

[0044] For example, although this operation gestalt explained XWindow of UNIX to the model, this invention is not limited to this but can be applied also to the window system of other formats.

[0045]

[Effect of the Invention] According to this invention, since an application program can specify an effective plane alternatively, the both sides by the side of application and a window system should manage only the specified effective plane.

[0046] Moreover, since the effective plane of the window which change produced is notified from a window system also in case other windows on display move, or it is closed and the field which was non-display until now changes to a viewing area, an

application program 5 should perform redraw processing etc. only to the plane notified.
[0047] According to this invention, from the above thing, the window system which can manage two or more GURAFIKU planes easily can be offered.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing having shown typically the example of a configuration of the hardware of the window system in this operation gestalt.

[Drawing 2] It is drawing having shown typically the example of a configuration of the software of the window system in this operation gestalt.

[Drawing 3] Window generating function CreateWindow() of a window system [in / in (a) / this operation gestalt] and (b) are the image Figs. having shown the example of assignment of an effective plane assignment flag (plane).

[Drawing 4] It is drawing having shown the example of a configuration of the region managed table of the window system in this operation gestalt.

[Drawing 5] In this operation gestalt, it is the image Fig. showing the example as which two windows are displayed on the GURAFIKU plane.

[Drawing 6] It is the image Fig. showing the example which divided into two display regions the viewing area of the window shown in drawing 5 .

[Drawing 7] It is the image Fig. showing the example which made the non-display field of the window shown in drawing 5 one non-display region.

[Drawing 8] It is the example of a region managed table in which the information on each region shown in drawing 6 – drawing 7 was stored.

[Drawing 9] In this operation gestalt, it is the display equipped with the GURAFIKU plane of two sheets, and is drawing which illustrated signs that each window was displayed.

[Drawing 10] It is drawing having shown the example of a display of a GURAFIKU plane shown in drawing 9 .

[Drawing 11] It is drawing having shown the example of a display of a GURAFIKU plane shown in drawing 9 .

[Drawing 12] In the GURAFIKU plane shown in drawing 10 , the lap part (non-display field) of a window is drawing having shown the example which changed to the viewing area.

[Drawing 13] In this operation gestalt, it is drawing showing the example of the redraw event information added at the time of the notice of a redraw event.

[Drawing 14] It is drawing which illustrates the processing sequence at the time of the redraw event in this operation gestalt.

[Description of Notations]

5 an application program

10....CPU

11 a bus

12a-12c Frame memory

13a-13c Memory controller

14 a plane composition controller

15 D/A (digital to analog converter)

16 a monitor

20 a window system

21a-21m Address attaching part

22a-22m Effective plane assignment flag

23, 23a-23m Region managed table

24 a display region table

25 a non-display region table

26 redraw event information

30 and 30a- 30c and 31 a graphic plane

40, 50, 60 Window

41 42 Display region

43 45 Non-display region
